



United States Department of the Interior

U.S. GEOLOGICAL SURVEY

New York Water Science Center

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Ithaca, NY 14850

607-266-0217

April 7, 2008

MEMORANDUM

To: Isabel Rodrigues, USEPA, New York, NY
From: David Eckhardt, USGS, Ithaca, NY
Subject: Review of RI Report for the Cayuga County Ground Water Contamination Site

I have reviewed the Draft RI Report for the Cayuga County Ground Water Contamination Site prepared by CDM and find that it provides a comprehensive description of the site. The report is well organized, fairly well written, and summarizes a complex mixture of information from a variety of sources. The following comments address several technical concerns that mainly focus on the hydrogeology of the Site. They are offered with the intent to strengthen the key issues that are presented. I have also written suggested revisions directly on the text pages, which are offered to improve the clarity, scope, and accuracy of the report.

1. ES-1 (¶3, 4): The plume extent is also within the City of Auburn. Note that Crane Brook and Owasco Outlet separately flow northward to the Seneca River (also 3-1).
2. ES-2 (¶2) and 1-3 (¶4): Note that New York State DEC started the initial site assessment in January 2001 and drilled four deep bedrock wells. Show the four DEC well locations on Figure 2.1.
3. Figure 1.1: Give the normal lake elevations (Cayuga is 382 ft; Owasco is 711 ft).
4. ES-2 (¶10): Clarify that the Powerex facility is upgradient of the deep aquifer flow at EPA-1 and EPA-2; the facility is downgradient of these wells in the shallow flow. Also clarify that that two horizontally-advective plumes exist at the facility -- one to the north in the shallow aquifer zones, and another to the south in the deep aquifer zones, and a downward flow component links the two plumes *at Powerex*.
5. ES-4 (¶5 and elsewhere throughout report): The till at B-49 is 77 ft thick, which is the maximum thickness observed in wells at the site.
6. ES-5 (¶1 and previous page): Add discussion that the Onondaga Limestone forms the uppermost units of the approximately 235-ft thick sequence of carbonate rock; the four members of the Onondaga Limestone consist of crystalline and flinty limestone with some thin interbedded bentonites and argillaceous limestones. The Onondaga Limestone overlies the limestone and dolostone of the Manlius Formation (Olney Member). Suggested revisions are given on the text pages.
7. ES-5 (¶3): Note comments on text pages about the hydraulic heads of the shallow and deep aquifer units.

8. ES-7 (¶2), ES-10, 4-14, and elsewhere: The discussion of the extent of deep contamination at well B-33D3 at the Powerex facility should be expanded to include wells B-31D3 and B-32D3, which are highly contaminated; these three wells show the broad spatial existence of VOCs in the D3 zone along the southern boundary of the GE property. Also, show on Figure 2.1 the D3 wells drilled and sampled by GE, including B-31 and B-32.
9. ES-7 (¶3 and elsewhere): We do not really know the angles of the faulting along Pinckney Road and Overbrook Drive, and I suggest that the term "low angle" be removed to simply state that thrust faulting is present.
10. ES-9 (¶4 and elsewhere): Add well B-47 to all discussions of the plume extent between West Genesee Street and Pinckney Road.
11. ES-13, 7-6, and elsewhere: The recommendations for vapor intrusion study must include the Bluefield Road and Overbrook Drive areas.
12. 1-3 (¶6): Were the Phase 1 VOC assessment samples all from discrete-packer zones? I recall that some open-borehole sampling was also done, which would represent multiple zones.
13. 1-6 (¶4): Give the range of VOC concentrations at the ATI site, and show the site location on Figure 2-2.
14. 2-2 and 2-3: Note that gas well logs are also available from USGS or CDM for the site; also note suggested revisions (on the text pages) to the log descriptions.
15. 2-4 (¶2): EPA-13 (not EPA-14) was renamed B-48; EPA-15 was renamed B-49.
16. 2-9 (¶3,4): Which wells were sampled by GE for split analysis as part of the RI? Note that multi-port wells that were dry or did not yield water were not sampled.
17. 2-11 (¶1): Note that GE contractors measured water levels in Powerex wells, in coordination with water levels measured by USGS in RI wells.
18. 3-3 (¶4): Add a sentence on the Oriskany Sandstone. Also, clarify the thrust faulting discussion as per comments on the text pages.
19. Figure 3-2: Identify the Owasco Outlet watershed as a tributary to the Seneca River.
20. 3-6 (¶1): The discussion of vertical mixing of VOCs through fractured and faulted zones at Pinckney Road and Overbrook Drive needs special attention here (and elsewhere) in the report. The evidence of ground-water upflow shows that it is transient and apparently related to pulses of recharge that move laterally through the deep, confined aquifer, which can cause periodic (seasonal) upflow of the artesian pulses where the confinement is breached by vertical fractures. We have seen upflow in borehole flowmeter logs at EPA-2, EPA-9, CY-204, CY-205, and CY-206. We also have seen vertical profiles of hydraulic heads that show upflow *potential* at EPA-9 and the B-49 cluster. The distribution of VOCs throughout the deep and intermediate zones at Pinckney Road and Overbrook Drive (and at EPA-2 and EPA-9) are further evidence of the vertical mixing of water and contaminants in these faulted and fractured areas. Furthermore, the faulted, vertical offset of shallow, intermediate and deep rock units has broken the stratigraphic continuity and juxtaposed these units, which also provides mixing pathways among zones. It should be noted, however, that the upflow appears to be transient; i.e., upflow can occur seasonally during winter recharge periods, but downflow can also occur during summer drainage periods.
21. 3-8 (¶2): Flow is southwest (not southeast) toward Cayuga Lake.

22. 3-8 through 3-10: Some suggested revisions are offered on the text pages for the cross sections B, C, and D. Note that east and west are transposed in the text (3-9, ¶4), and that no D1 zone exists at EPA-14 (3-9, ¶6).
23. 3-9 (¶6): Note that the wetted S1 heads (S2 at EPA-14) along the D-D' section show that ground-water may be perched in the Marcellus and shallow Onondaga zones. At CY-204 and CY-205, the perched water in the Marcellus Formation (S1) is indicative of the lack of recharge potential to the underlying carbonate rock aquifers due to the thick shale cover along Pinckney Road and Overbrook Drive.
24. 3-11 (¶2): The implied linkage between EPA-1 and B-33 and Pinckney Road is misleading. I suggest that the VOCs in the D3 zone be first documented at the B-31, B32, and B-33 wells at Powerex, then linked to EPA-1, EPA-2, and B-43, then to the Pinckney Road wells.
25. 3-11 (¶4, 5): A figure added to the report that shows representative vertical head profiles at EPA-1, EPA-2, B-33, and B-49 for a summer drainage period versus a winter recharge period would provide a useful illustration to the discussion of differences in the spatial competency of the aquitard and vertical flow potentials.
26. Table 2-8: The layout of this table is difficult to read and appears to be incomplete. Could the data be better presented if sorted by date?
27. 3-11 (¶2): This paragraph is a bit disjointed, and I have suggested some revisions directly on the text pages to help clarify how fractures and faults can cause the S3/I1-I2/D1 aquitard to leak. Plots of vertical head profiles would again be useful.
28. 3-11: Note that precipitation data exist at sites closer than Syracuse (i.e., Auburn, Aurora, and Mud Lock at Cayuga). GE uses data from Mud Lock at the outlet of Cayuga Lake, available from New York State DOT.
29. 4-5 (¶7): Give the well and zone location for the maximum vinyl chloride level.
30. 4-6 (¶2): Correct the CY-205 typo.
31. 4-7 (¶2): Check the maximum TCE concentration.
32. 4-7 and 4-8: The well depths (bgs) are correct, but the associated elevations are for top of casing (not well depth). Please correct at four spots indicated on text pages.
33. 4-11 (¶1): No flow data exist to link the toluene at EPA-20S3 to Powerex. Delete.
34. 4-13 (¶2): The statement on no IC exceedances in the deep zones north of Pinckney Road is incorrect. Delete.
35. 4-13 and 4-14: I have offered some suggestions directly on the text pages to revise and clarify the discussions for cross sections A, B, C, and D. These critical sections will get close scrutiny and public comment, and several errors and inconsistencies need correction. For example the caliper shift at B-49 (cross section B) is due to the HQ casing, not the fractures. The rock core for this well, however, did show thick till (to 77 ft) and extensive fracturing of the shallow bedrock (to 207 ft). B-43 (not B-33) is in section C, and its rock core again showed extensive fracturing as did the logs at adjacent well EPA-2. The flow-log data show upward flows at EPA-2 and EPA-9 in section B. The discussions of upward and downward flows (such as in the western areas of the D section and at B-49) need clarification. Also, the listing of wells that show contamination in these cross sections is incomplete.
36. Figures 4-7 through 4-10: *cis*-DCE is incorrectly spelled out as an ethane; it should be *ethene*. Check other figures for this correction. Remove "Low Angle" from the inferred thrust fault explanation. Also, the water levels for these four cross sections

are already shown in Figures 3-5 and 3-11 through 3-13; the repetition of the same water-level data on Figures 4-7 through 4-10 is confusing and obscures the water-quality data, which should be the focus.

37. 4-16 (¶2): The downward migration of VOCs should be stated within the explicit context of the shallow source areas at Powerex, not elsewhere.
38. 4-11 (¶2) and 7-2 (¶5): The Village wells are 900 ft *north* (or *north-northeast*) of the sampled springs. Show the location of the Village well field on Figs. 2-5 and 4-14.
39. 5-6 (¶6): The statement on specific yield as a measure of effective porosity does not apply to confined aquifers and solution features in karst bedrock.
40. 5-9 (¶4, 5) and 5-20 (¶1): The shallow and deep occurrence of IC contamination needs to be clarified; clearly identify the context for the EPA Site versus the NYSDEC (Powerex) site, which has significant shallow contamination.
41. 5-14 (¶2) and 5-15 (¶3): The presence of hydrogen sulfide gas in water from specific sample zones is clearly noted on the USGS-ERT sampling forms. This provides strong evidence of reducing conditions, notably at EPA-01D3.
42. 5-15: No mention is made of iron reduction (FeII/FeIII).
43. 5-20 (¶1): See comments 20 and 37 and the suggested revision to this paragraph.
44. 5-20 (¶3): Add B-47 and EPA-3 to the discussion, as indicated.
45. 5-21 (¶2): See comments 8 and 37 and the suggested revision to this paragraph.
46. 5-22 (¶1): Diffusion of (probable) DNAPL and (documented) high concentrations of dissolved TCE into the rock matrix, fractures, and honeycombed solution features of the gypsum D3 zone at Powerex provides a significant retardant to transport (and a difficult remedial challenge).
47. 5-22 (¶4): See comment 11.
48. 5-23 (¶3): See comments 40 and 46 relative to bullets 1 and 2.
49. 7-1 (¶3): Powerex is CERLA, not RCRA.
50. 7-1 (¶3, 4): See comments 8 and 37 and the suggested revision to this paragraph.
51. 7-4: See comment 11 for Recommendation 1.
52. Figures 3-5 and 4-7: The Camillus Shale intersects the bottom of well EPA-25.
53. Figures 3-11 and 4-8: Extend the construction log to match the depth of the stratigraphic log for well 20652 on sections B-B'.
54. Figures 3-13 and 4-10: I suggest removing the arrows showing an upward gradient. Upflow may occur seasonally during winter recharge periods, but downflow may also occur during summer drainage periods.
55. Figure 5-1: DCE is *ethene*, not ethane. Note that the true thickness of the Camillus Shale is not shown. See suggested additional arrows for recharge and discharge.

Please contact me to discuss any review comments. I would be happy to assist with additional review of revised materials.

Sincerely,

David A. V. Eckhardt

David A.V. Eckhardt
Research Hydrologist

Attached: Revised text pages